Hi, I’m Elias

- I’m a Civil Engineer and Computer Scientist from Brazil BR

- I’ve been leading and contributing to BIM-related projects since 2016, with a strong focus on automation and data governance.

buildingSMART

FOUNDATION

Professional Certification

About Me

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https://github.com/EliasMPJunior

+55 21 999 556 033

/elias-magalhaes

- Certified BIM Specialist by buildingSMART International
- Developer of ontology-based systems for engineering workflows
- I work with IFC, IDS, BCF, and IfcOpenShell to build custom tools for model validation and auditing
- Passionate about traceability, open standards, and semantic interoperability
- I work at the intersection of infrastructure, software engineering, and information modeling

First Project: HBIM for Theatro Municipal (2016–2018)

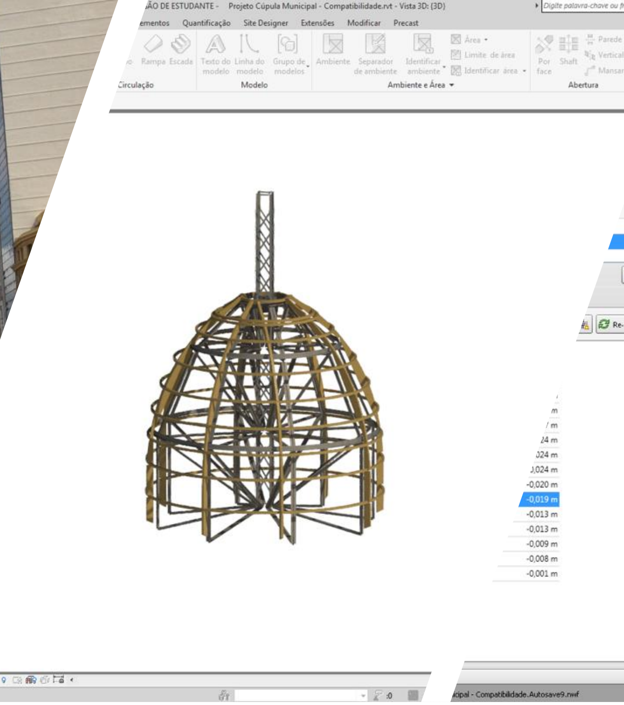
My first major BIM project was part of a research initiative at Tecgraf / PUC-Rio, focused on the Theatro Municipal do Rio de Janeiro.

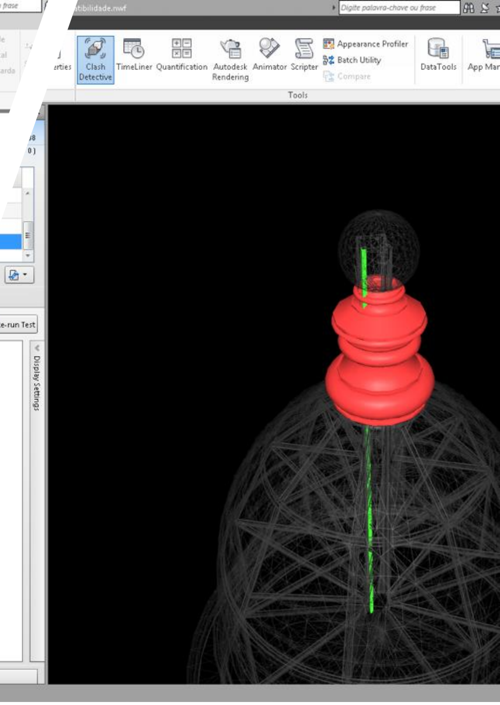
🎯 Objective:

- Build a 3D as-is model
- Prototype a Digital Twin for maintenance planning
- Link structured (IFC) and unstructured data (docs, reports)

🛠 My Role:

- Led a team of 4 junior modelers
- Developed a ‘3D Database’ based on a neutral NoSQL HBIM structure using MongoDB
- Converted IFC to JSON and built recursive data access tools
- Applied software engineering design patterns


ÃO DE ESTUDANTE - Projeto Cúpula Municipal - Compatibilidade.rvt - Vista 3D: {3D}
Quantificação
Site Designer
Extensões
Modificar
Precast
Rampa
Escada
Texto do modelo
Linha do modelo
Grupo de modelos
Ambiente
Separador de ambiente
Identificar ambiente
Área
Limite de área
Identificar área
Por face
Shaft
Parede
Vertical
Mansarda
Circulação
Modelo
Ambiente e Área
Abertura


Clash Detective
TimeLiner
Quantification
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Animator
Scripter
Appearance Profiler
Batch Utility
Compare
DataTools
Tools
Re-run Test
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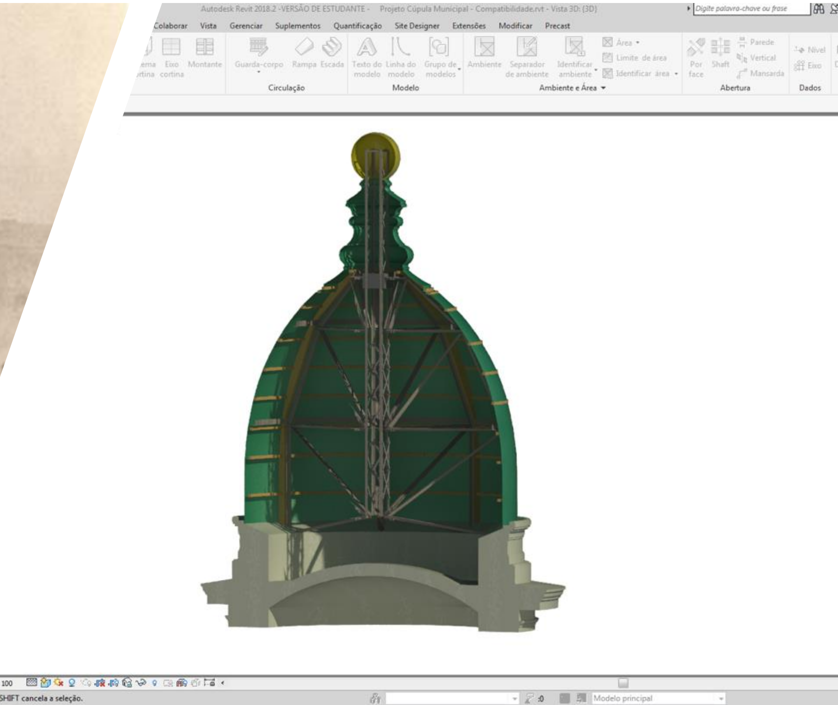
Autodesk Revit 2018.2 - VERSÃO DE ESTUDANTE - Projeto Cúpula Municipal - Compatibilidade.rvt - Vista 3D: {3D}
Colaborar
Vista
Gerenciar
Suplementos
Quantificação
Site Designer
Extensões
Modificar
Precast
Guarda-corpo
Rampa
Escada
Circulação
Modelo
Ambiente e Área
Abertura
Dados
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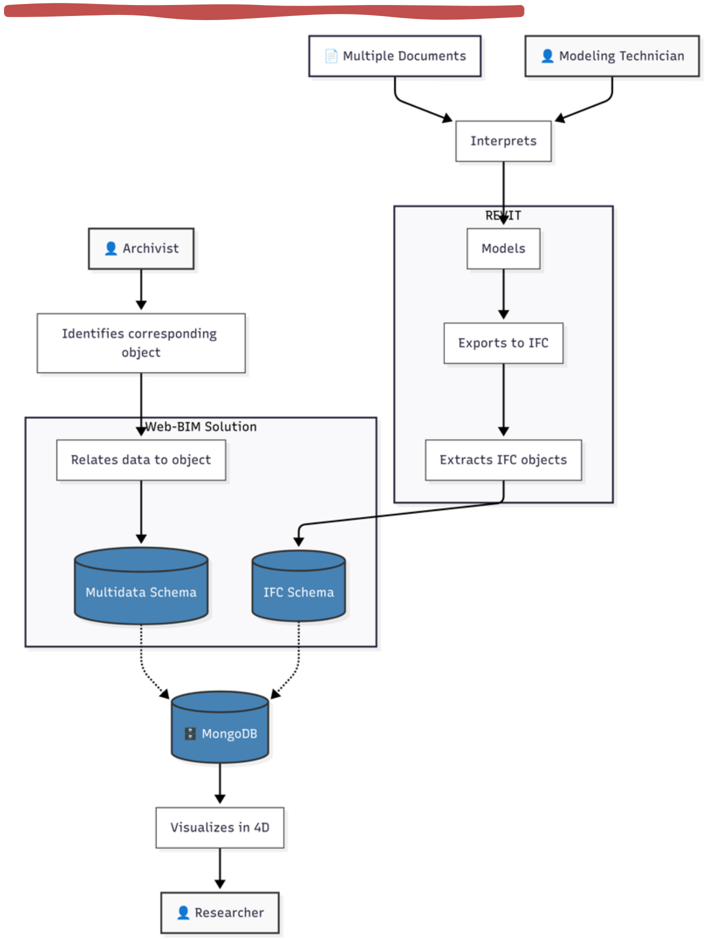
ativas, CTRL adiciona, SHIFT cancela a seleção.
Modelo principal

HBIM Platform From Documents to Structured 3D Data



Input: Multiple documents are interpreted and manually modeled in Revit

Modeling: Revit exports the model as IFC

IFC Extraction: Objects and properties are extracted from the IFC

Data Mapping: Structured data is linked to IFC objects using unique IDs

Multidata Schema stores enriched external information

IFC Schema stores parsed geometry and relationships

Storage: Everything is stored in a custom NoSQL database

Navigation: Recursive object navigation via getIfcObject()

Links: Structured and unstructured data (e.g. images, PDFs) linked to elements

Validation & Typing: Area mismatch alerts

Visualization: Outputs can be explored in 4D via integrated viewer

Design Patterns (used in the architecture):

- Factory Pattern → object instantiation from IFC types
- Adapter Pattern → unifying different schema sources
- Strategy Pattern → validation and visualization rules per object class
- Recursive Descent → for object navigation inside the schema

BIM Cycle: Connecting Office Tools to BIM (2020–2023)

BIM Cycle was born to connect project management tools with BIM authoring environments.

🎯 Goal:

- Automate integration between Trello, MS Teams, Google Drive, openBIM and Revit
- Link API calls and model parameters

👦 💻 Context:

- Designed for architecture firms using task-based workflows

BIM Cycle: Technical Stack & Automations

⚙ Tools:

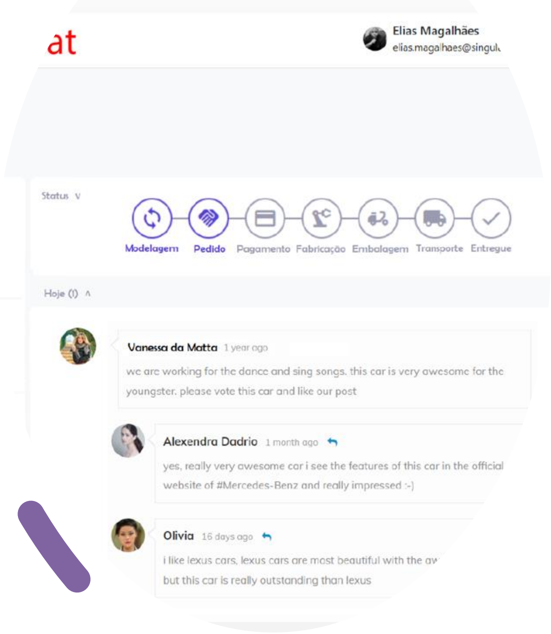
- Revit API with C# and custom Python scripts
- REST APIs, Webhooks & JSON-based workflows
- Git for IFC version control and traceability

🔁 Key Automations:

- Trello → Revit sync (automated task-driven updates)
- Revit → Microsoft Teams notifications (real-time feedback loop)
- Full metadata traceability across platforms

🧩 Innovations:

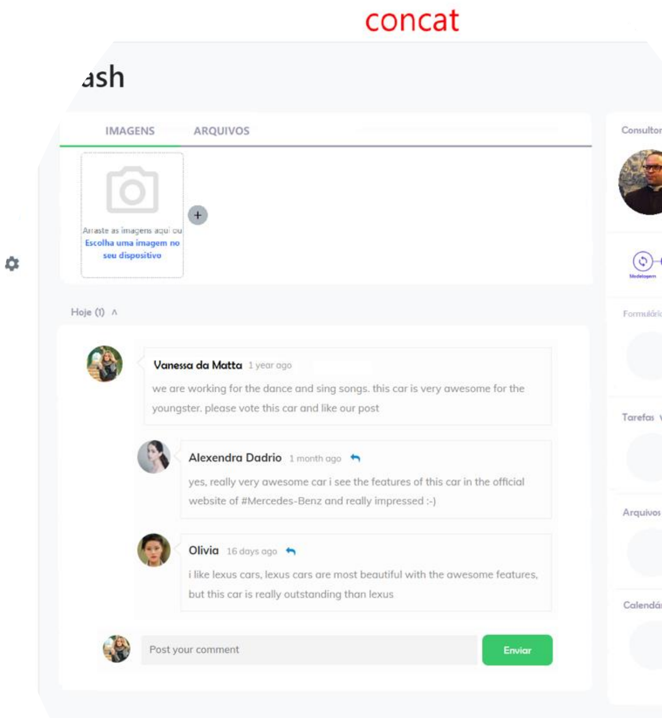
- Task-centric BIM coordination: model updates follow task workflows
- Unified perspective: task → model → linked documents, all in sync
- Even CRM data was dynamically injected into the model context



Vanessa da Matta 1 year ago
we are working for the dance and sing songs. this car is very awesome for the youngster. please vote this car and like our post

Alexendra Dadrio 1 month ago
yes, really very awesome car i see the features of this car in the official website of #Mercedes-Benz and really impressed :-)

Olivia 16 days ago
i like lexus cars, lexus cars are most beautiful with the av
but this car is really outstanding than lexus



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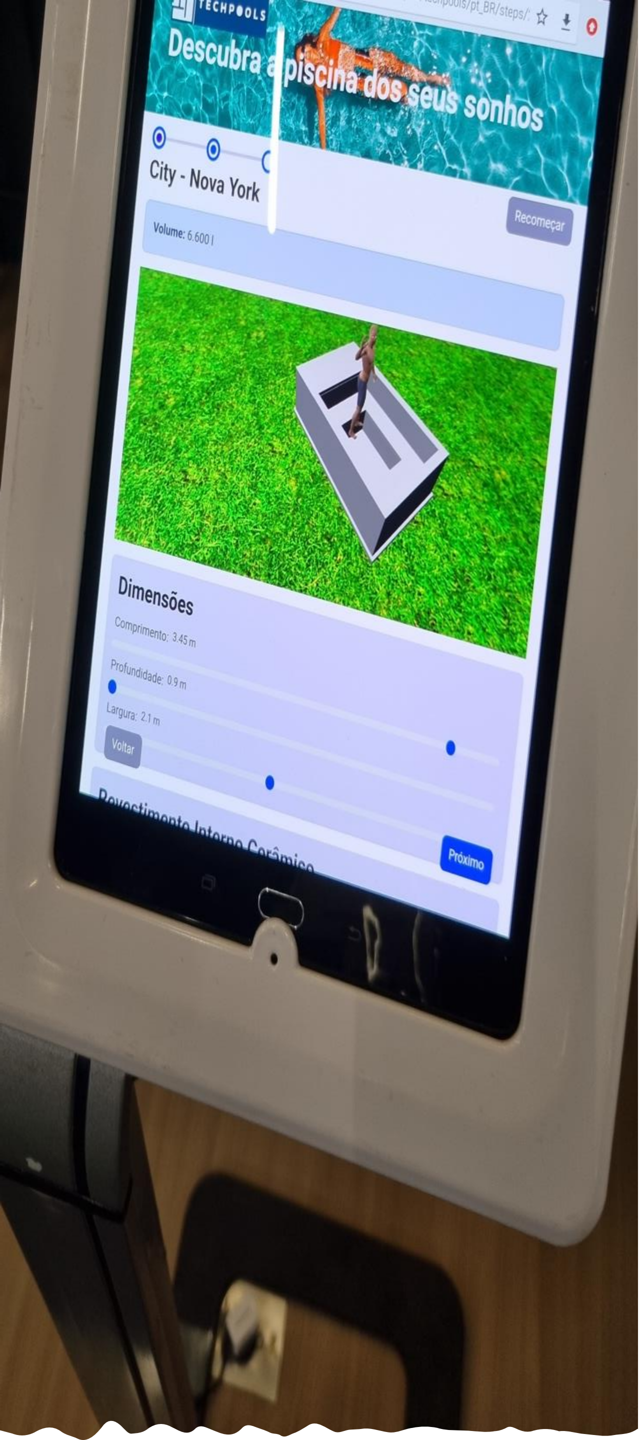


City - Nova York

Volume: 6.600 l

Dimensões

Comprimento: 3.45 m

Profundidade: 0.9 m

Largura: 2.1 m

Revestimento Interno Cerâmico

TechPools: Custom Pools for Industry 4.0

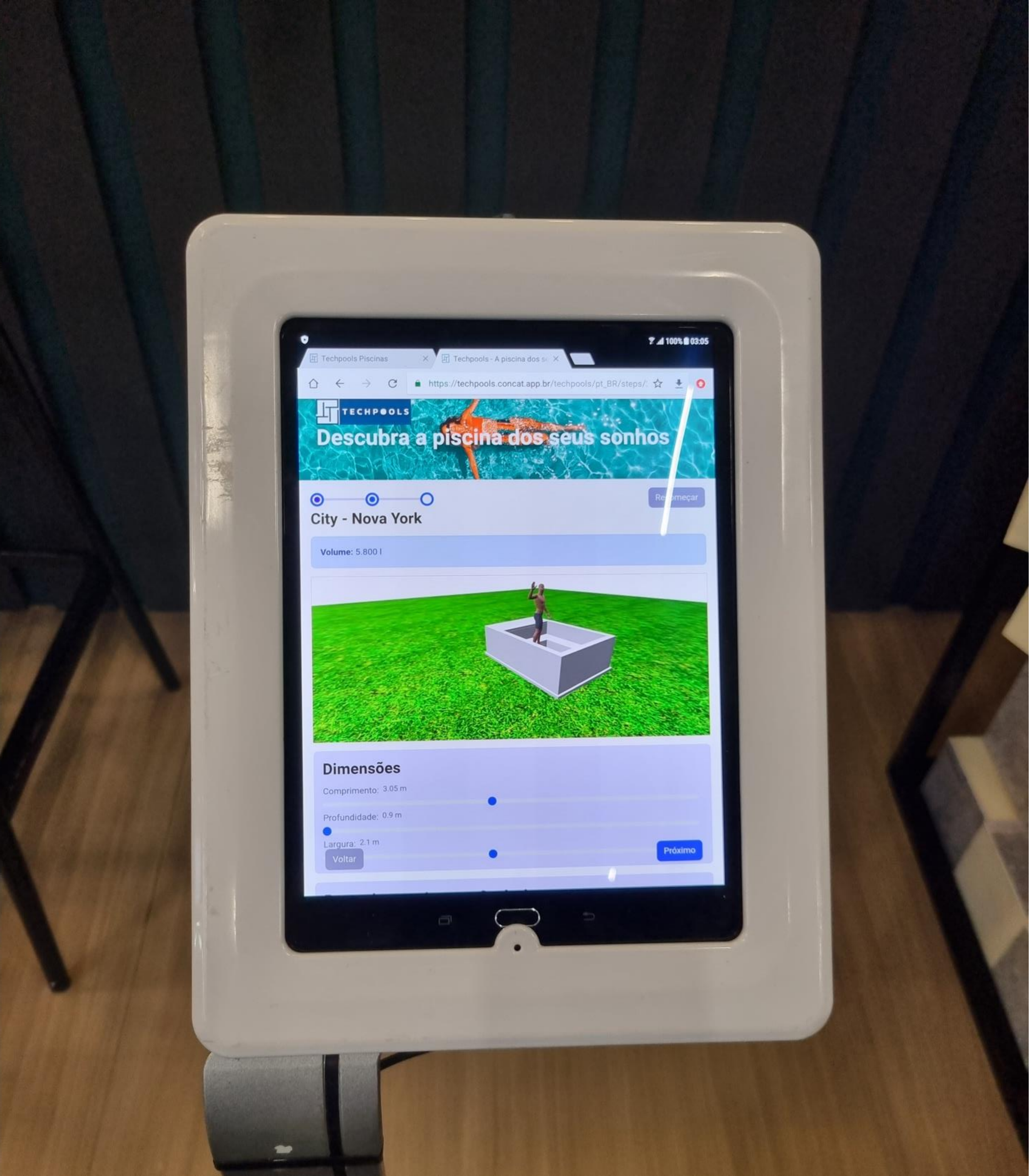
TechPools was a smart pool configurator using fiberglass composite panels (FCM).

🎯 Goal:

- In-store customization + real-time pricing + logistics feedback

🧱 Features:

- IFC → GLTF visualization
- User-configurable geometry (dimensions, ladder, deck)
- Built for a factory selling modular pools



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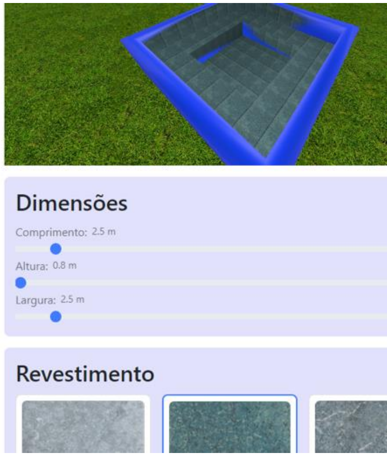


Dimensões

Comprimento: 2.5 m

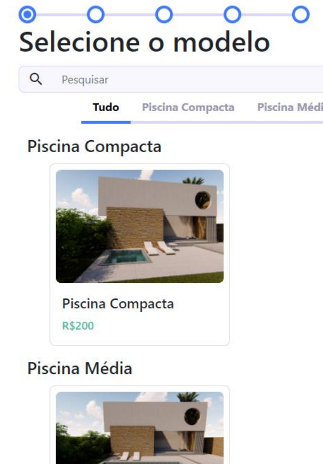
Altura: 0.8 m

Largura: 2.5 m

Revestimento

techpools piscinas

Gerencie orçamentos da melhor forma



Selecione o modelo

Pesquisar

Tudo | Piscina Compacta | Piscina Médi

Piscina Compacta

Piscina Compacta
R$200

Piscina Média

TechPools:

Architecture & Automation

⚙️ Stack:

- IFC → glTF conversion for frontend visualization
- IFC export used as input for pricing engine
- RabbitMQ queue triggers pricing engine
- WebSocket responses provide real-time feedback

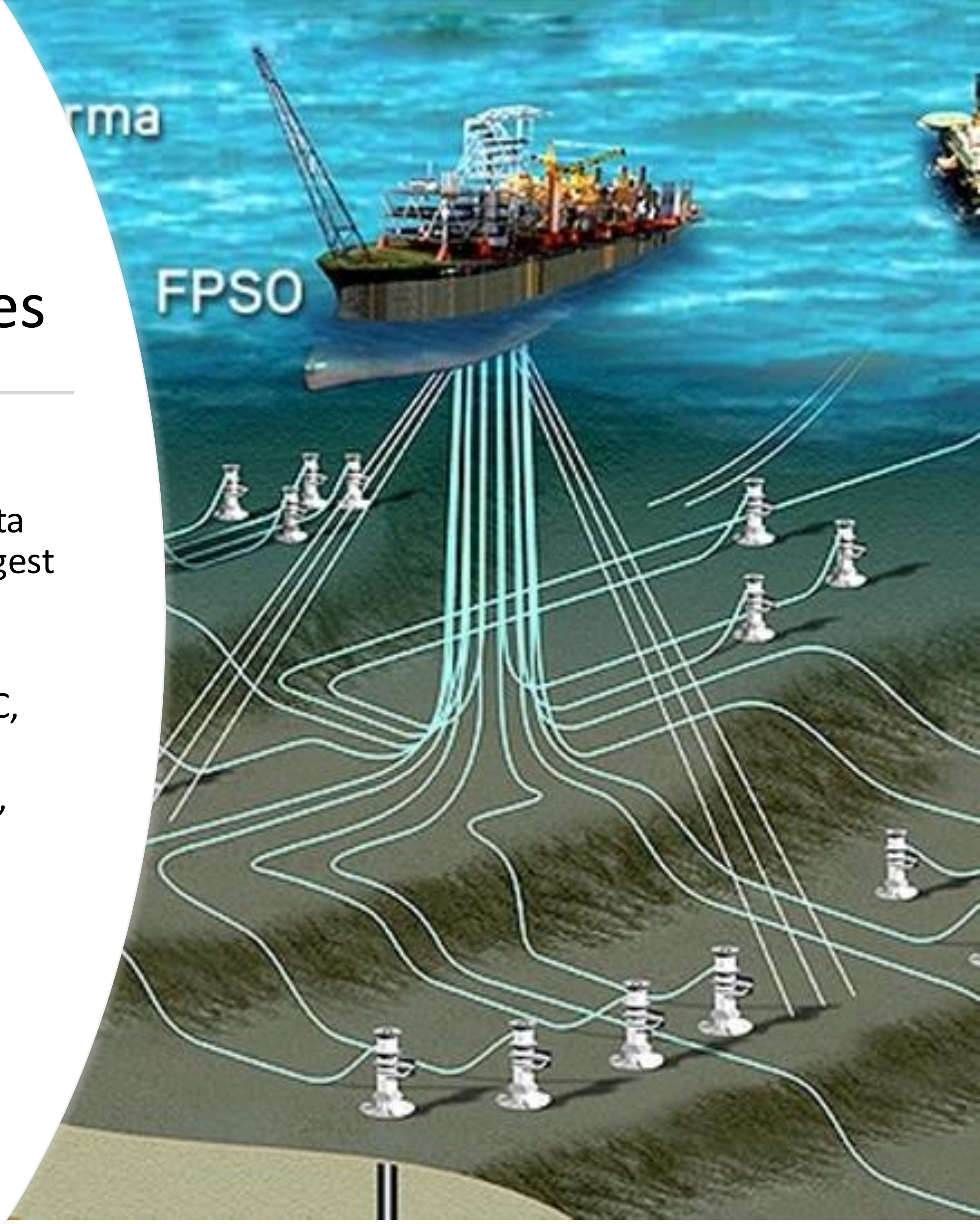
🚚 Logistics:

- RabbitMQ queue activates the shipping cost calculator
- Planned: assembly 3D tutorials for field teams
- Panel layout optimizer to reduce waste and speed up fabrication

CDE for Oil & Gas: Overview & Objectives

Between 2023 and 2025, I led the architectural design of a Common Data Environment (CDE) for the Brazil's largest oil company.

- Built with OpenBIM principles (IFC, BCF, IDS)
- Designed for ducts, electrical, gas, water, and oil systems
- Focused on legal deliverables, auditing, and compliance
- Fully modular, event-driven, and scalable by design



Versioning & Global ID Control

VERSION

- Each IFC element which is derived from a Root has version control

1

CHANGES

- Any change to a single element automatically creates a new version
- When someone references the element, they get the latest version
- This provides independence between the elements; they do not need to evolve together

2

DATABASE

- It’s easier to find elements because relational databases have solved this for years,
- You can use any commercial database
- No specific database is required, and it can export to IFC

3

MVDs

- You have the data, the data is in the database
- You can define multiple MVDs to export this data; enabling MVD-level control

4

IFC

- This data can be exported to IFC 2x3, IFC4, IFC 4x2, IFC 4x3, and in the future, IFC5
- Multiple IFC files are supported for federated modeling and data merging

5

EXPORT

- You choose the target version when exporting
- The same applies to import: importing an IFC file brings all its elements into the database

6

GLOBAL ID

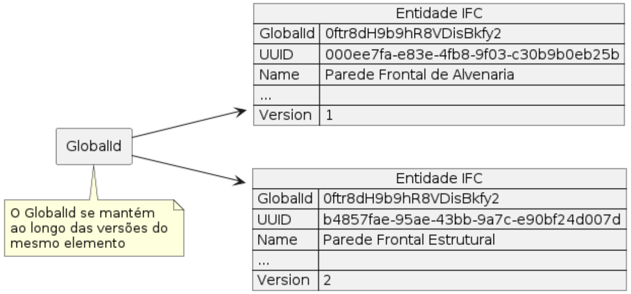
- If the IFC file contains a GlobalID that already exists in the system, a new version is created; it is not duplicated
- Versioning is controlled through the Global ID, which stays consistent across all versions and software tools of the same object

7

INTERACTIONS

- Each version has a UUID, used internally
- External interactions with the CDE are done via the Global ID: when calling the API, you pass the Global ID, and it automatically returns the latest secure version

8



O GlobalId se mantém ao longo das versões do mesmo elemento

Entidade IFC	
GlobalId	0ftr8dH9b9hR8VDisBkfy2
UUID	000ee7fa-e83e-4fb8-9f03-c30b9b0eb25b
Name	Parede Frontal de Alvenaria
...	
Version	1

Entidade IFC	
GlobalId	0ftr8dH9b9hR8VDisBkfy2
UUID	b4857fae-95ae-43bb-9a7c-e90bf24d007d
Name	Parede Frontal Estrutural
...	
Version	2

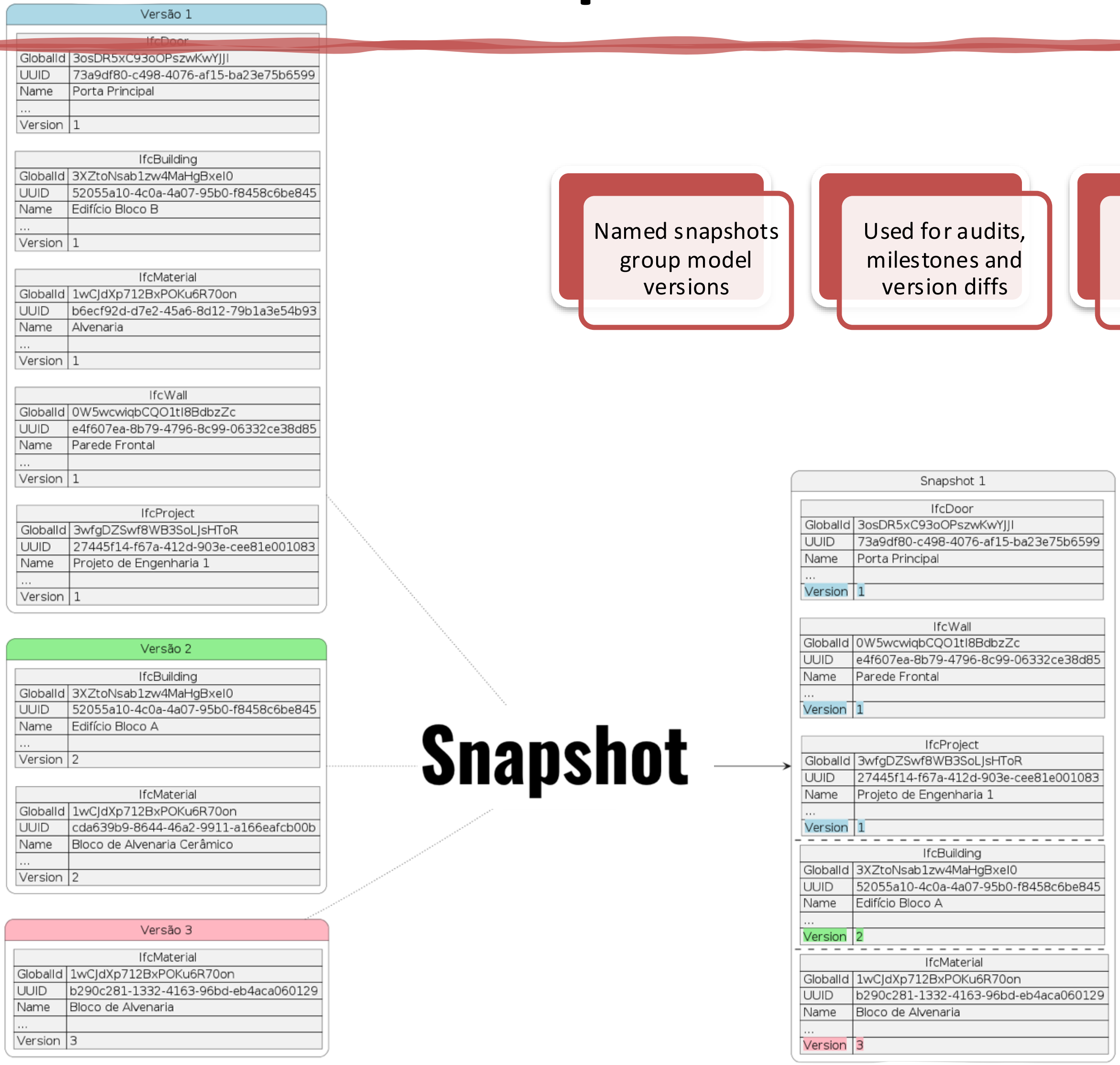
Time-Stamped Model States

Named snapshots group model versions

Used for audits, milestones and version diffs

Fully traceable, reproducible

MVD filters are applied per snapshot



Versão 1

IfcDoor	
GlobalId	3osDR5xC93oOPszwKwYJJI
UUID	73a9df80-c498-4076-af15-ba23e75b6599
Name	Porta Principal
...	
Version	1

IfcBuilding	
GlobalId	3XZtoNsab1zw4MaHgBxeI0
UUID	52055a10-4c0a-4a07-95b0-f8458c6be845
Name	Edifício Bloco B
...	
Version	1

IfcMaterial	
GlobalId	1wCJdXp712BxPOKu6R70on
UUID	b6ecf92d-d7e2-45a6-8d12-79b1a3e54b93
Name	Alvenaria
...	
Version	1

IfcWall	
GlobalId	0W5wcwiqbCQO1tI8BdbzZc
UUID	e4f607ea-8b79-4796-8c99-06332ce38d85
Name	Parede Frontal
...	
Version	1

IfcProject	
GlobalId	3wfgDZSwf8WB3SoLJsHToR
UUID	27445f14-f67a-412d-903e-cee81e001083
Name	Projeto de Engenharia 1
...	
Version	1

Versão 2

IfcBuilding	
GlobalId	3XZtoNsab1zw4MaHgBxeI0
UUID	52055a10-4c0a-4a07-95b0-f8458c6be845
Name	Edifício Bloco A
...	
Version	2

IfcMaterial	
GlobalId	1wCJdXp712BxPOKu6R70on
UUID	cda639b9-8644-46a2-9911-a166eafcb00b
Name	Bloco de Alvenaria Cerâmico
...	
Version	2

Versão 3

IfcMaterial	
GlobalId	1wCJdXp712BxPOKu6R70on
UUID	b290c281-1332-4163-96bd-eb4aca060129
Name	Bloco de Alvenaria
...	
Version	3

Snapshot 1

IfcDoor	
GlobalId	3osDR5xC93oOPszwKwYJJI
UUID	73a9df80-c498-4076-af15-ba23e75b6599
Name	Porta Principal
...	
Version	1

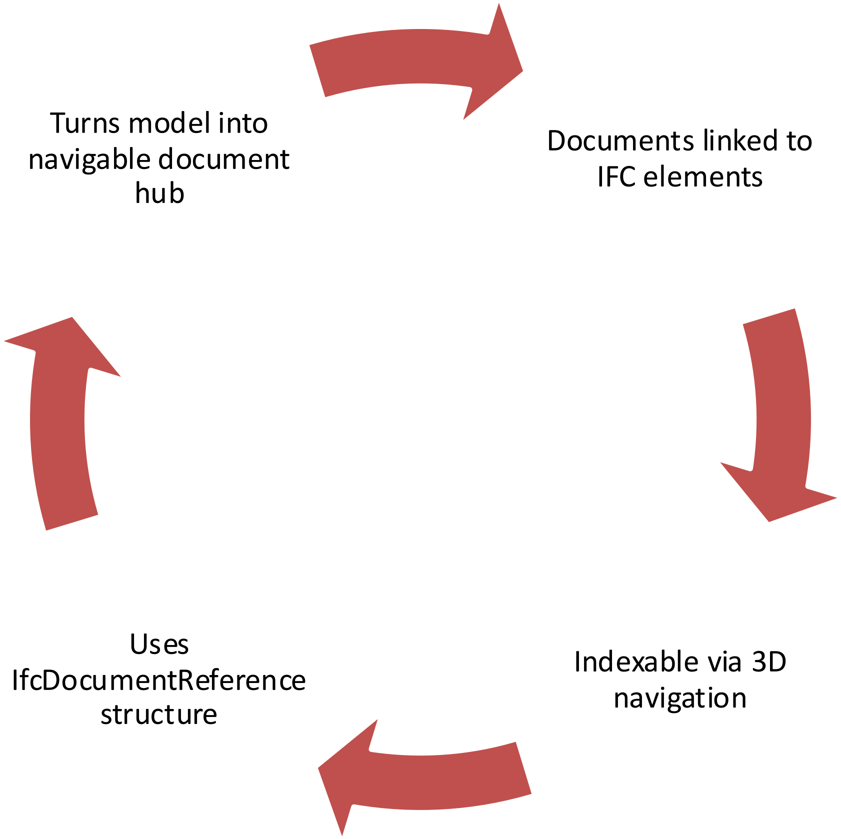
IfcWall	
GlobalId	0W5wcwiqbCQO1tI8BdbzZc
UUID	e4f607ea-8b79-4796-8c99-06332ce38d85
Name	Parede Frontal
...	
Version	1

IfcProject	
GlobalId	3wfgDZSwf8WB3SoLJsHToR
UUID	27445f14-f67a-412d-903e-cee81e001083
Name	Projeto de Engenharia 1
...	
Version	1

IfcBuilding	
GlobalId	3XZtoNsab1zw4MaHgBxeI0
UUID	52055a10-4c0a-4a07-95b0-f8458c6be845
Name	Edifício Bloco A
...	
Version	2

IfcMaterial	
GlobalId	1wCJdXp712BxPOKu6R70on
UUID	b290c281-1332-4163-96bd-eb4aca060129
Name	Bloco de Alvenaria
...	
Version	3

Document Injection & 3D Indexing

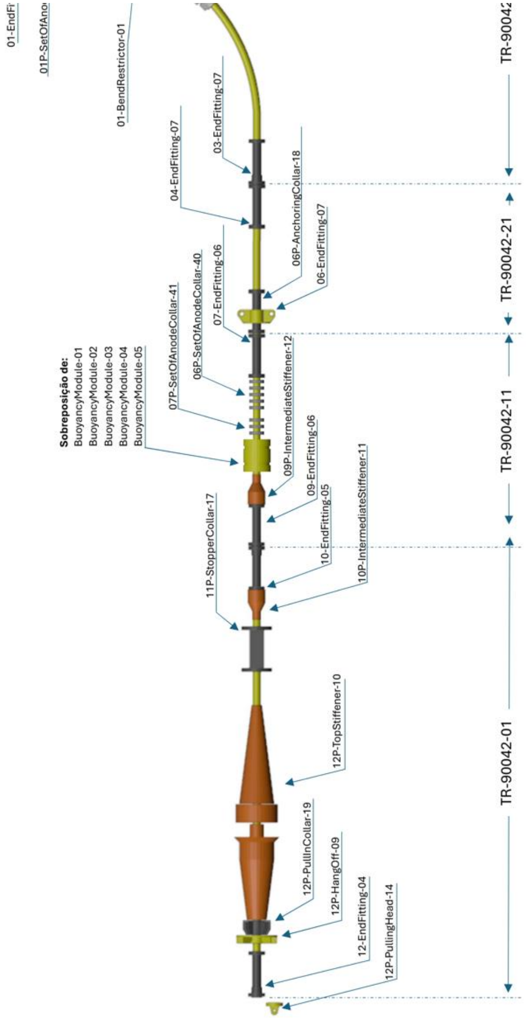


Documents linked to IFC elements

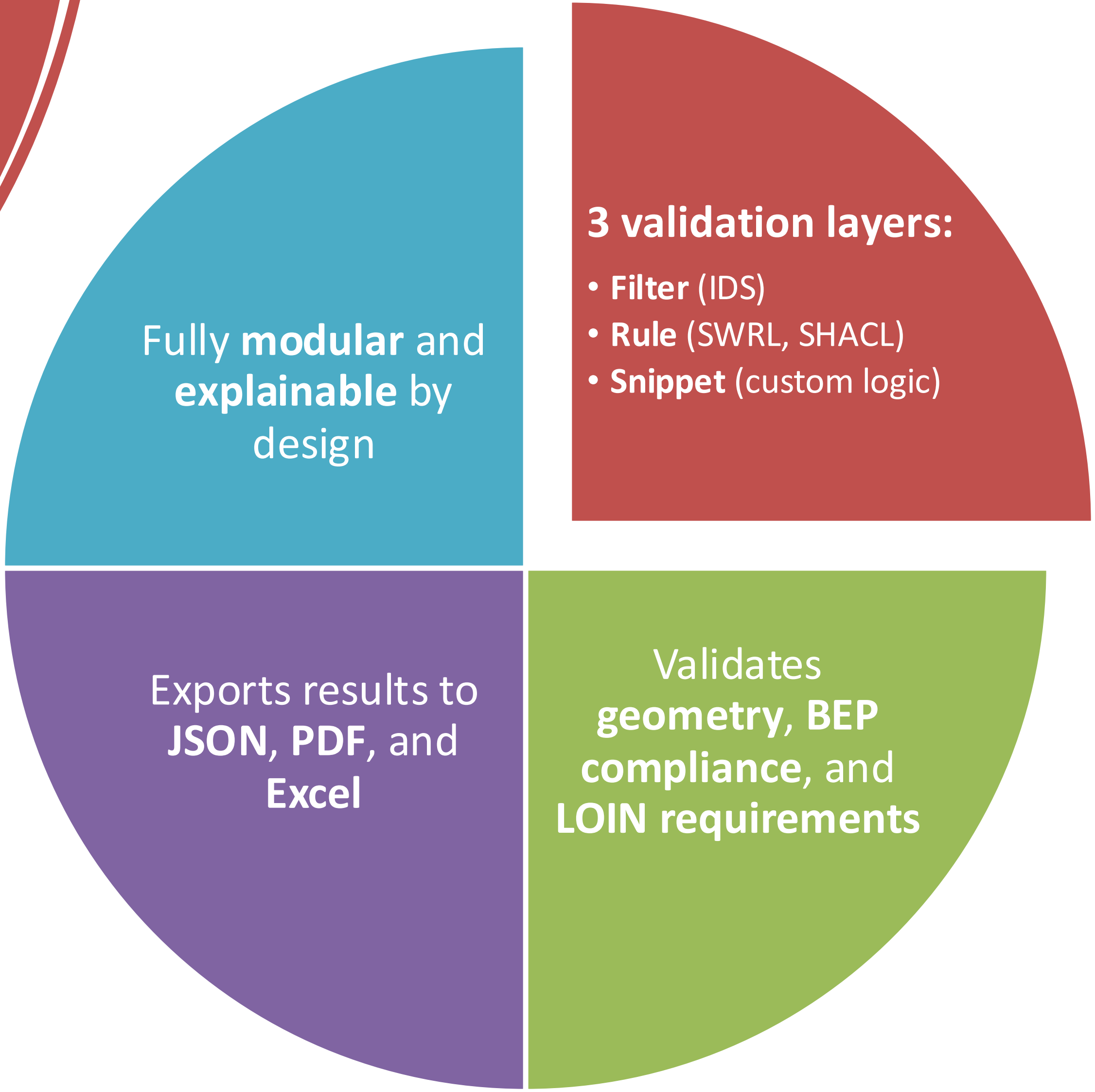
Indexable via 3D navigation

Uses IfcDocumentReference structure

Turns model into navigable document hub



Automated Rule Checking with IDS



Fully **modular** and **explainable** by design

3 validation layers:

- **Filter** (IDS)
- **Rule** (SWRL, SHACL)
- **Snippet** (custom logic)

Exports results to **JSON**, **PDF**, and **Excel**

Validates **geometry**, **BEP compliance**, and **LOIN requirements**

Event Queue, Notifications & Services

EXT. SERVICE

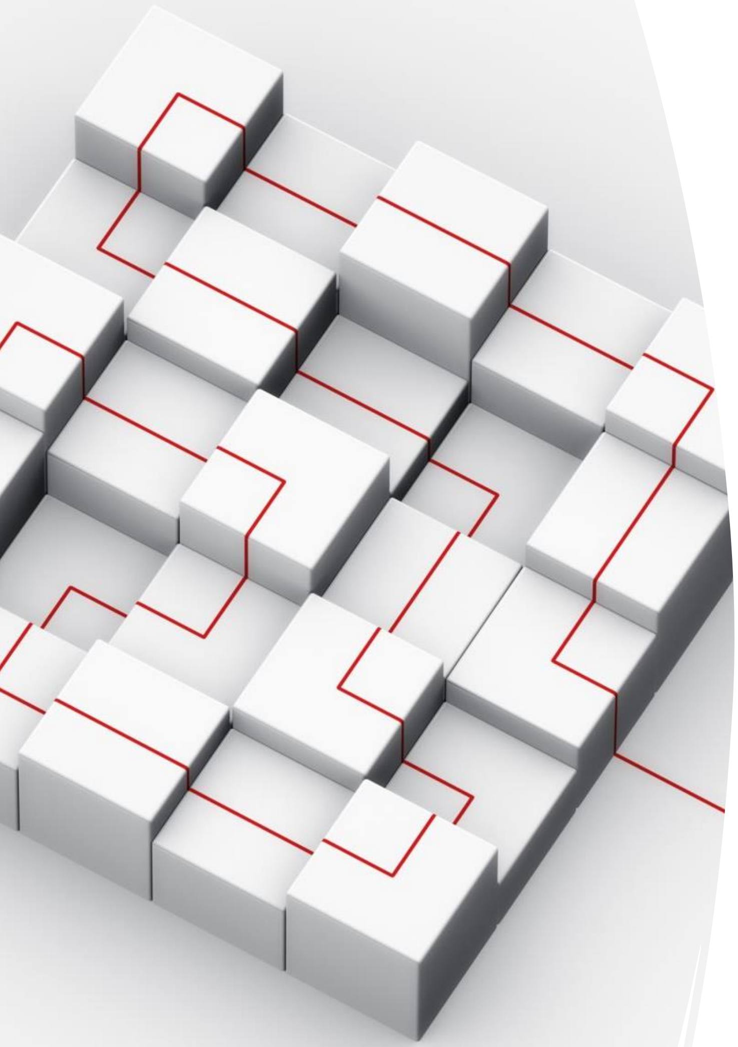
- Parts of the model can be routed to specialized external services for domain-specific processing
- Examples include:
  - BCF-based issue tracking and coordination
  - Oil flow simulation and pipeline analysis

CHANGES

- Notifies any change that occurs in the model
- Notifies all listeners (subscriptions)
- Changes can occur at both the element and snapshot levels. Listeners can track changes at the snapshot level (e.g., if a snapshot changes) and at the individual element level
- Includes impact reporting for traceability

PROCESSING

- Two types of distributed processing:
  - Service-level distribution (data sent to external services)
  - System-level distribution (data processed via distributed systems)



🧠 What’s Next?

OntoBDC:
A Living Ontological Framework

- OntoBDC is a living framework for building semantically structured and dynamic systems.
- Auto-generates backend and frontend from OWL ontologies.
- Combines Clean Architecture, Event Sourcing, CQRS, and Context Cubes.
- Eliminates logic duplication and promotes true interoperability.
- Modular, extensible, and ideal for complex domains like BIM and CRM.

👉 ***“A system born from meaning, not from code.”***

The Pain: Rigid Systems, Broken Interfaces

- Legacy systems with fixed, hard-to-maintain structures
- Logic duplicated across backend, frontend, and business rules
- Poor interoperability with other apps or standards (e.g., IFC in BIM)
- Lack of traceability and version control for data changes
- Interfaces often misaligned with business logic
- Affected domains: BIM & CDEs, CRM & Team Management, Government systems, Microservices

👉 ***“Rework, dependency, and lack of adaptation. OntoBDC changes the game.”***

🛠️ From Ontology to System

- Ontology (OWL) → JSON Schema → Dynamic CRUD
- Event Sourcing + CQRS → full auditability
- Context Cubes: Session, Lifecycle, Sync, Tracking
- Multi-dimensional state reconstruction at any time
- Ports & Adapters: domain logic fully decoupled from infrastructure

🏗 OntoBDC + BIM
Where Semantics Meet IFC

- Integrates with ifcOWL, SHACL, BCF, IDS
- Custom ontologies: OntoBDC-BIM, -Construction, -Activity, -Event
- Semantic modeling of IfcBuilding, IfcSpace, IfcStorey, IfcSite
- Ontology-based rule checking and automated validations
- Future integration with 3D visualization and state tracking

👉 ***“Every piece of data has a why, a when, and a how.”***

A Future Where Systems Describe Themselves

- Natural language → Ontology → Working system
- AI-powered schema inference and real-time validation
- **Semantic CI/CD**: automatic deployment from ontology
- Cloud Pieces: systems built from semantic components
- Full ontological autoprogramming
- **Roadmap**: Natural Language, Microservices, Event Streams, Observability, Self-Programming

👉 ***“You describe your domain. It becomes a system.”***

Want to learn more about OntoBDC?

- OntoBDC is already powering solutions in BIM, CRM, and compliance.
- It’s modular, scalable, and ready to integrate with your ecosystem.
- Built for real-world complexity, with auditability and automation by design.

👉 ***This technology can be part of your projects!***

📩 ***Feel free to reach out for a live demo or technical discussion.***

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